

What is claimed is:

1. A variable optical filter comprising:

first and second filter sections connected in series to each other, each having a filter characteristic whose transmissivity is changed periodically along an optical frequency axis, the filter characteristic having variable transmissivity and capable of being moved in parallel to an optical frequency axis direction, and also the same filter characteristic can be set within a common variable range in the optical frequency axis direction; and

a control section for, when the filter characteristic of one of said first and second filter sections is required to move in parallel to the optical frequency axis direction to exceed the variable range, relatively controlling the filter characteristics of said first and second filter sections such that the switching is performed from one filter section to the other filter section, provided that the overall filter characteristic of when said first and second filter sections are combined becomes constant.

2. A variable optical filter according to claim 1,

wherein, when said first filter section is in a state in which the filter characteristic thereof is flat with respect to optical frequency so that the maximum transmissivity can be obtained, and the overall filter characteristic is determined by the filter characteristic of said second filter section, then before the parallel movement of the filter characteristic of said second filter section in the optical frequency axis direction reaches a boundary of the variable range, said control section performs the switching from said second filter section to said first filter section by reducing continuously the amplitude of the transmissivity of said first filter section while increasing continuously the amplitude of the transmissivity of said second filter section, provided that the overall filter characteristic of when said first and second filter sections are combined becomes constant. .

3. A variable optical filter according to claim 2,

wherein said control section, when performing the switching from said second filter section to said first filter section, controls a phase of said first filter section so that the parallel movement of the filter characteristic of said first filter section in the optical frequency axis direction becomes a state corresponding to the vicinity of the center of the variable range.

4. A variable optical filter according to claim 1,

wherein, when said first filter section is in a state in which the filter characteristic thereof is flat with respect to optical frequency so that the maximum transmissivity can be obtained, and the overall filter characteristic is determined by the filter characteristic of said second filter section, then before the parallel movement of the filter characteristic of said second filter section in the optical frequency axis direction reaches a boundary of the variable range, said control section performs the switching from said second filter section to said first filter section by reducing continuously the amplitude of the transmissivity of said first filter section while increasing continuously the amplitude of the transmissivity of said second filter section, provided that the overall filter characteristic of when said first and second filter sections are combined becomes constant,

and said control section successively controls a phase of said second filter section so that the parallel movement of the filter characteristic of said second filter section in the optical frequency axis direction becomes a state corresponding to the vicinity of the center of the variable range,

and said control section performs the switching from said first filter section to said second filter section by increasing continuously the amplitude of the transmissivity of said first filter section while reducing continuously the amplitude of the transmissivity of said second filter section, provided that the overall filter characteristic of when said first and second filter sections are combined becomes constant..

5. A variable optical filter according to claim 1, further comprising;
an optical amplification section for compensating for losses occurring in said first and second filter sections.
6. A variable optical filter according to claim 5,
wherein said optical amplification section is arranged between said first and second filter sections.
7. A variable optical filter according to claim 1,
wherein said first and second filter sections each comprises a plurality of period filters with mutually different periods connected in series.
8. A variable optical filter according to claim 1,
wherein said first and second filter sections each includes a Mach-Zehnder interferometer type filter.

9. An optical transmission system for collectively amplifying a wavelength division multiplexed signal light using an optical amplifier arranged on an optical transmission path, and also compensating for a tilt occurring in the wavelength division multiplexed signal light using at least one gain equalizer to repeatedly transmit the wavelength division multiplexed signal light,

wherein said gain equalizer includes a variable optical filter recited in claim 1.

10. An optical transmission system according to claim 9,

wherein in said variable optical filter, said first and second filter sections are arranged in different repeating intervals.

11. A method of controlling a variable optical filter with a filter characteristic whose transmissivity is changed periodically along an optical frequency axis,

wherein for first and second filter sections connected in series to each other, each having a filter characteristic whose transmissivity is changed periodically along an optical frequency axis, the filter characteristic has variable transmissivity and can be moved in parallel to an optical frequency axis direction, and also the same filter characteristic can be set within a common variable range in the optical frequency axis direction, when the filter characteristic of one of said first and second filter sections is required to move in parallel to the optical frequency axis direction to exceed the variable range, the filter characteristics of said first and second filter sections are relatively controlled such that the switching is performed from one filter section to the other filter section, provided that the overall filter characteristic of when said first and second filter sections are combined becomes constant.

12. A method of controlling a variable optical filter according to claim 11,

wherein, when said first filter section is in a state in which the filter characteristic thereof is flat with respect to optical frequency so that the maximum transmissivity can be obtained, and the overall filter characteristic is determined by the filter characteristic of said second filter section, then before the parallel movement of the filter characteristic of said second filter section in the optical frequency axis direction reaches a boundary of the variable range, the switching from said second filter section to said first filter section is performed by reducing continuously the amplitude of the transmissivity of said first filter section while increasing continuously the amplitude of the transmissivity of said second filter section, provided that the overall filter characteristic of when said first and second filter sections are combined becomes constant .